


**TASK ORDER SUBMITTAL  
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**DRAFT TECHNICAL MEMORANDUM**

Date: February 17, 2006  
To: Alan Goodman, EPA Region 10  
From: Scott Elkind, Parametrix   
Subject: Updated Conceptual Site Model for the Hamilton-Labree Site  
cc: Mike Warfel, Parametrix  
David B. Mayfield, Parametrix  
Project Number: 415-2328-007 (024/DE09)  
Project Name: Hamilton Labree Roads Fund-Lead RI/FFS

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## INTRODUCTION

EPA Region 10 has requested the Parametrix Team (Contractor) to provide technical support for the development of a Remedial Investigation/Focused Feasibility Study (RI/FFS) for the Hamilton/Labree Roads Groundwater Contamination Superfund Site in Chehalis, Washington. The goal of this technical memorandum is to present an updated Conceptual Site Model (CSM), which includes both the Hamilton Road Impact Area (HRIA) and Breen Property, for use in preparation of the Baseline Risk Assessment and the Remedial Investigation (RI) report.

Development of a CSM is an integral component of a RI because it guides the documentation of the nature and extent of contamination at a release site and assessment of potential risks posed to human health and the environment by the release. The CSM provides a logical and sequential view of the chemicals of potential concern (COPCs) from the original source and release areas, during migration through environment media, and to potential human and environmental receptors.

## OBJECTIVES

The objectives of this updated CSM for the Hamilton/Labree Roads site are as follows:

- Utilize information from the CSMs prepared by SLR International Corp and Farallon Consulting (2003) for the Breen Property and by URS (2004) for the HRIA to develop an updated CSM for the overall site.
- Develop a CSM that incorporates both the HRIA and the Breen contaminant source areas, accounts for potential pathways to receptors, and provides the Contractor toxicology staff with a generalized model for development of more detailed pathway and receptor models as part of the risk assessment.

## OVERVIEW OF THE CSM

The updated CSM is shown diagrammatically in Figure 1. Brief descriptions of the elements of the CSM are provided in the following sections.

### Primary Sources of Contamination and Primary Release Mechanisms

The two primary sources of contamination at the Hamilton/Labree Roads site appear to be:

- Liquid tetrachloroethene (PCE) released directly into Berwick Creek within the HRIA.
- PCE leaked or spilled onto the soil at both the HRIA and Breen Property. The form of the PCE released (concentrated liquid or PCE dissolved in solutions) is unknown.

### Secondary Sources of Contamination

Upon contact with the water in Berwick Creek, some of the PCE immediately dissolved into the water and was carried downstream with the flow of the creek. The bulk of the PCE remained in liquid form and migrated quickly through the water column into the creek sediments under the influence of gravity, since the density of PCE is greater than water. Once in the creek sediments, the PCE continued to migrate vertically downward through the porous creek sediments until constrained by the lower-permeability silt and clay strata that occur beneath the stream channel and directly above the shallow groundwater aquifer in the HRIA. The PCE would slowly migrate through the low permeability silt and would slowly leach to groundwater.

PCE introduced into the soils beneath the HRIA and Breen Property would have behaved in accordance with the nature of the soils. Fine-grained surficial soils would tend to retain the PCE. More permeable soils would allow PCE to migrate vertically downward more quickly.

In areas near the contamination sources, PCE present in liquid form as a dense non-aqueous-phase liquid (DNAPL) may collect on top of low-permeability zones in strata below the water table. The DNAPL would gradually dissolve to groundwater providing an additional source of PCE contamination in groundwater.

### Secondary Release Mechanisms

When a released contaminant is retained in an environmental medium such as soil or sediment, the medium functions as a secondary source for further release of the chemical. The following paragraphs discuss the release mechanisms from the secondary sources.

#### *Sediment Migration in Berwick Creek*

Contaminated sediment in Berwick Creek has the potential to migrate downstream under the influence of the stream current. The timing and magnitude of migration depends upon surface water flow conditions that change seasonally under the influence of precipitation.

### ***Leaching from Contaminated Berwick Creek Sediment to Surface Water***

Contaminated sediment that migrates downstream is in constant contact with surface water, creating the potential for leaching of PCE to surface water at points downstream from the original release to Berwick Creek.

### ***Volatilization from Surface Water to Air***

PCE that may become dissolved in Berwick Creek water via sediment contact would be subject to volatilization from the water into the ambient air. The magnitude of this volatilization would depend upon the concentrations in the stream and ambient weather conditions.

### ***Volatilization from Soil to Air***

Soil contaminated with PCE provides the potential for volatilization and release of PCE to ambient air, depending upon soil concentration, distance between the contamination and the surface of the soil, and weather conditions.

### ***Leaching to Groundwater***

Precipitation infiltrating through soil contaminated with PCE is a mechanism for migration of PCE to groundwater. Groundwater occurs at relatively shallow depths in the study area, and the rate and magnitude of migration depends on the nature of the soils above the water table and the amount of seasonal precipitation.

### ***Volatilization from Groundwater through Soil to Air***

Volatilization of PCE in groundwater has the potential to migrate to the soil and ultimately to ambient air. Such releases would be dependent upon the concentration in groundwater, the depth of groundwater below land surface, presence or absence of a low-permeability layer above the groundwater table, and weather conditions.

### ***Downgradient Discharge from Groundwater to Berwick Creek***

Hydrogeologic data collected in the study area indicates that the reach of Berwick Creek that flows through the HRIA and Breen areas is underlain by fine-grained silt and clay, which separates the stream from groundwater. If this layer is absent or breached by the Berwick Creek downstream (west) of the HRIA and Breen areas, the potential exists for PCE-contaminated groundwater to enter the stream. A flow gradient from shallow groundwater to the creek would be required for this to occur, which appears to be unlikely based on the prevailing groundwater gradient to the west, parallel to the creek and the Newaukum River.

## **Exposure Media**

Contact with PCE contamination from the HRIA and Breen areas of the site has the potential to occur in the following environmental media:

- Indoor Air

- Outdoor Air
- Soil
- Groundwater
- Surface Water
- Creek Sediments

## **Exposure Pathways**

Contaminants in the exposure media described above require a completed exposure pathway to come in contact with human health or environmental receptors. Potential exposure pathways potentially present within the study area consist of direct contact, inhalation, and ingestion. The likelihood that any of these pathways are complete with respect to receptors on and in the vicinity of the site is addressed in the following section.

## **Receptors**

Potential receptors of contaminant exposure originating from the Hamilton/Labree Roads site have been separated in two major categories for the CSM: human health and biota. In addition, subcategories for human health and biota also appear in the CSM. Brief descriptions of these grouping are provided below.

### ***Human Health***

#### Occupational

People who are working full days at a location are considered in the occupational exposure scenario. This population would include employees at local businesses and construction workers involved in excavation or grading projects.

#### Residential/Recreational

Residential exposures involve people who live in an area with potential exposure to contamination. Examples of this scenario for the site include residents who use groundwater for water supply west of the source areas (i.e., not connected to a public water supply). Recreation exposures pertain to potential intermittent contact with contaminated media during recreational outings, such as while visiting a park.

### ***Biota***

#### Aquatic

This subcategory of environmental receptor applies to organisms that live in the waters and sediments of Berwick Creek. Such life forms could include fish, insects, and crustaceans.

#### Terrestrial

Wildlife in the upland environment comprise the terrestrial subcategory and include mammals, birds, reptiles, insects, and worms.

## Complete Versus Incomplete Pathways

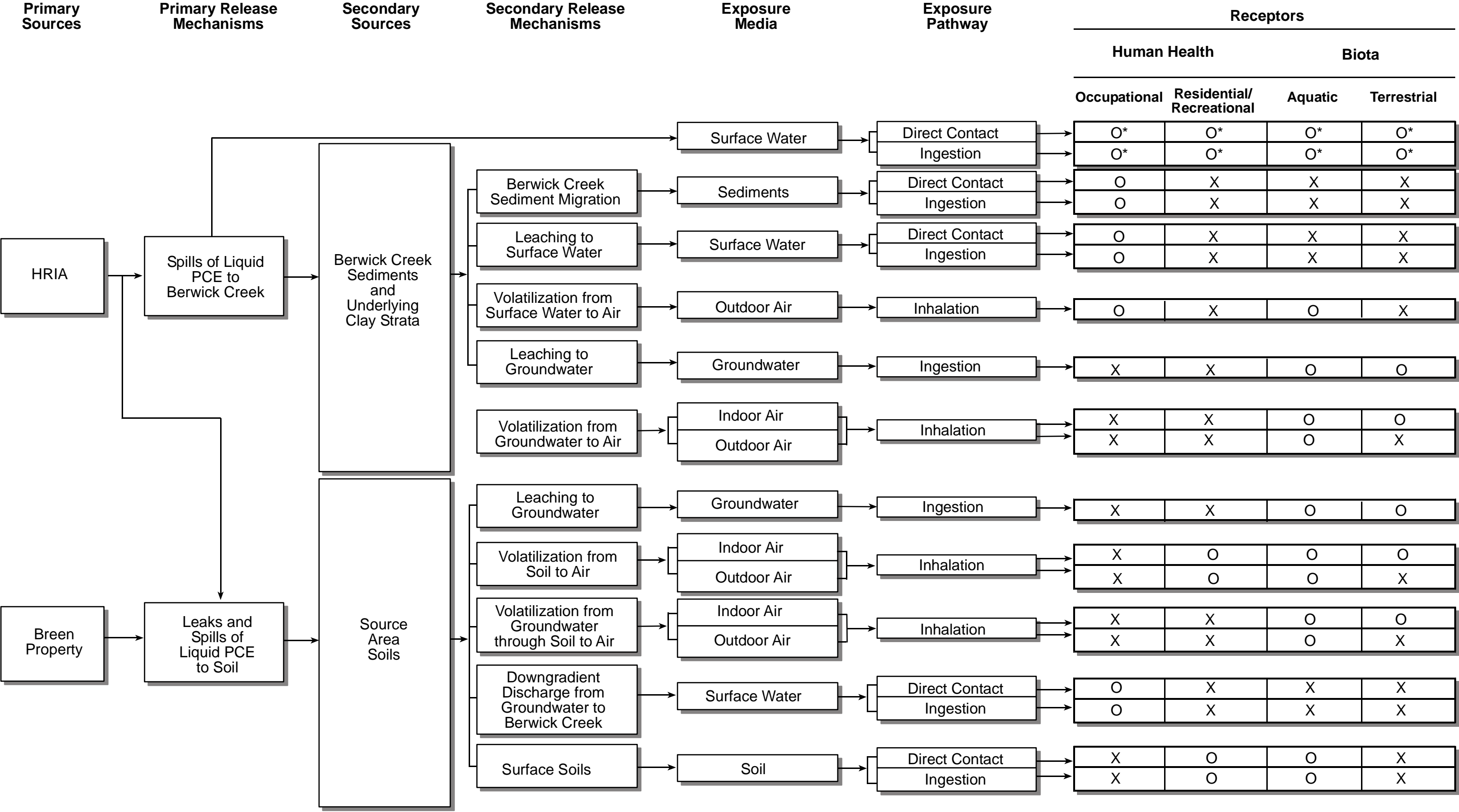
The “X” and “O” symbols in the boxes under the receptors columns in the CSM (see Figure 1) indicate potentially complete and likely incomplete exposure pathways, respectively. The part of the CSM will serve as the starting point for the Risk Assessment. If the Risk Assessment identifies exposure pathway information that differs from the CSM of Figure 1, the CSM will be modified appropriately.

## REFERENCES

- Farallon Consulting. 2003. *Remedial Investigation/Feasibility Study Work Plan, Hamilton/Labree Roads Groundwater Contamination Superfund Site, Chehalis, Washington*. Prepared for S.C. Breen Construction Company. Issaquah, Washington. July.
- URS. 2004. *Draft (Revision 1) Engineering Evaluation/Cost Analysis Report, Hamilton Road Impact Area, Hamilton-Labree Roads Superfund Site, Chehalis, Washington*. Prepared for USEPA Region 10 under RAC Contract 68-W-98-228. August.

**FIGURE 1**

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NOTES:  
X = Potentially Complete Exposure Pathway  
O = Incomplete Exposure Pathway  
\* Initial mass of dissolved PCE in surface water moved downstream and is no longer present

Figure 1  
Conceptual Site Model  
Hamilton Labree Superfund Site  
Chehalis, Washington